

REF 713

EXPANDED TECHNICAL ASSISTANCE PROGRAM

FAO Report No. 625

Report to the Government
of
YUGOSLAVIA
on
PROPOSALS FOR THE EXPANSION OF THE
PLANT PROTECTION SERVICES



FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

ROME, 1957

REPORT
TO
THE GOVERNMENT OF YUGOSLAVIA
ON
PROPOSALS FOR THE EXPANSION OF THE
PLANT PROTECTION SERVICES

by
R.W. Marsh, Plant Pathologist

Rome, 1957

CONTENTS

	<u>Page</u>
INTRODUCTION	1
I. THE PROBLEM	1
II. SUMMARY OF RECOMMENDATIONS	2
III. ACCOMPLISHMENTS	3
IV. FACTORS AFFECTING THE SOLUTION OF THE PROBLEM:	5
1. Advisory sector	5
2. Aims in strengthening advisory work in plant protection services	5
3. Research sector	6
4. Plant quarantine sector	7
5. Provision and testing of crop protection equipment	7
APPENDIX A. Specifications for the recommended Weed Control Laboratory and Information Center.	8

INTRODUCTION

In accordance with the provisions of Supplemental Agreement No. 18, jointly signed by the Government of Yugoslavia and the Food and Agriculture Organization of the United Nations (FAO) on 2 March 1953, Mr. R.W. Marsh was appointed under the Technical Assistance Program for a period of three months to advise and assist the Government of Yugoslavia in the organization of a more effective plant disease and insect pest control program through such measures as:

- (i) appraising pest control work of existing phytosanitary stations in the country;
- (ii) assisting in the planning, organization and implementation of a program for the elimination or reduction of losses caused to crops and fruit by injurious plant diseases and insect pests.

Mr. R.W. Marsh served from 3 April to 30 June 1956, the period 14 April to 25 June being spent in Yugoslavia.

The expert wishes to record his indebtedness to all authorities and individuals concerned with his visit. He received unstinted help and co-operation, and retains grateful memories of the kindness and hospitality shown to him throughout Yugoslavia.

I. THE PROBLEM

Yugoslavia's total imports in 1955 were U.S. \$450 millions, exports \$225 millions. Before the 1939-45 war Yugoslavia was a food-exporting country; she now imports wheat, tallow and lard from the United States and olive oil from Italy. Wheat, maize and livestock production per head of total population has fallen to two thirds of the prewar level.

Apart from bauxite and lead, Yugoslavia's present and potential exports are almost all agricultural and forestry products. For example, timber exports to the United Kingdom in 1955 were valued at \$7,000,000, apples and pears exports at \$400,000. The average export of dried plums and plum pulp is 40,000 tons yearly; other important fruit exports are walnuts, almonds, grapes and figs. Wine and spirit exports were valued at over 200 million dinara in 1950. Maize is exported in years of good harvests.

The serious depreciations in yield due to the ravages of pests, diseases and weeds are well known to the Yugoslav agricultural scientists who have published comprehensive accounts; for example in the textbooks of Professor Josifović and in the scientific periodical Zastita bilja (Plant Protection). Among the best-known causes of widespread losses are the gypsy moth (Lymantria dispar), the pine sawfly (Diprion pini), the fall webworm (Hypaenaria cunea), the Colorado beetle (Leptinotarsa decemlineata), the San José scale (Aspidiotus perniciosus), the codlin moth (Carpocapsa pomonella), the sarka virus of plums, and the phanerogamic parasitic weeds Cuscuta and Orobancha spp.

Serious pests of more local distribution are locusts in the southern areas and Capnodis tenebrionis on the roots of cherries in the Adriatic zone.

The prevalence in cereal crops of common weeds such as corn cockle (Agrostemma), poppy (Papaver), convolvulus, docks (Rumex), and thistles (Cirsium) is apparent everywhere, and the loss of wheat alone from this cause has been estimated at over 300,000 tons annually. Other serious weed problems are widely found in pastures and forage crops, industrial crops (such as sugar beet, flax, hemp and sunflowers), vineyards, orchards and fruit plantations. Weed control is also needed in ponds and waterways, and along railways and roadsides.

For the majority of the pests, diseases and weeds causing crop losses in Yugoslavia, the means of control are known; the difficulty lies in disseminating the necessary information, materials and equipment. There are however certain subjects (e.g. sarka, Cuscuta, Orobanche and specific weed problems), which are of special importance in Yugoslavia and for which solutions are not available. Consequently, developments are needed in both the advisory and the research aspects of plant protection.

II. SUMMARY OF RECOMMENDATIONS

(1) The economic benefit of reducing crop losses caused by pests, diseases and weeds cannot be fully realized until information on control measures is disseminated to all crop growers. The first requisite for this dissemination is the strengthening of advisory work in plant protection. The existing services in Yugoslavia require expansion both in staff and equipment.

(2) It is recommended that Councils be set up at Federal and Republic level, charged with the duty of ensuring that the necessary expansion takes place with the minimum of delay. These Councils should also aim at greater unification of plant protection work and improvements in the conditions of the advisory service.

(3) The extension of modern methods of weed control would raise the yields of cereals and other crops. More knowledge of this subject is needed to meet the special requirements of Yugoslavia and it is recommended that the proposals for a weed control laboratory and information center be implemented forthwith (see Appendix A).

(4) It is agreed that costs of building and furnishing the weed control laboratory should be the responsibility of the Yugoslav Government and it is proposed that the site should be provided and the cost of salaries, wages and running expenses met by the Faculty of Agriculture of the University of Belgrade. The cost of the special equipment required for the laboratory and greenhouse (see Appendix A) is estimated at \$2,500; the cost of equipment for field experiments at \$4,000, and the cost of books, etc. for forming the nucleus of a library at \$300.

(5) To promote the rapid development of the weed control laboratory and information center, it is suggested that the Technical Assistance Programs for 1957 and 1958 include:

- a) sending two Yugoslav scientists with experience of weed control to England for six months, their program to include visits to the Oxford University Unit of Experimental Agronomy and the Research Stations at Fernhurst and Chesterford Park;
- b) providing a technical expert in weed control to visit Yugoslavia for three months to advise on the program of the weed control laboratory and information center.

III. ACCOMPLISHMENTS

With the help of the United Nations Technical Assistance Board representative for Yugoslavia, and his staff, working arrangements were made and a program of visits drawn up in consultation with the Federal Office of the Yugoslav Economic and Technical Assistance Administration and later with its representatives in the Republics of Serbia, Croatia, Slovenia, Bosnia-Herzegovina and Macedonia. Contacts were also maintained with the Federal Administration for Plant Protection, Federal Chamber of Agricultural and Horticultural Institutes at Čačak, Peć and Novi Sad, and with the agricultural administrations of the Republics and of the Autonomous Regions of Kosmet and Vojvodina. Discussions were also held with representatives of Chambers of Agriculture and Unions of Co-operatives in the various Republics.

An attempt was made to cover the field of plant protection in Yugoslavia as widely as possible in the ten weeks available for travelling. Many of the plant protection stations were found to be concerned with the control not only of pests and diseases but also of weeds and therefore the term 'plant protection' in this Report includes weed control.

The principal places visited were:

Serbia (Belgrade area): Belgrade University Faculties of Agriculture and Forestry; University Farm and plantations at Radmilovac; Institute for Plant Protection at Topčider; Institute of Forestry; Laboratory for Biological Control of Insects; Institute for Ecology; Belgrade District Plant Protection Station. (elsewhere in Serbia): Šabac Plant Protection Station and Zorka Chemical Factory; Vladimirci Plant Protection Office; Pancevo Rit State Farm; Valjevo Plant Protection Station; Čačak Fruit Institute and Plant Protection Station.

Vojvodina: Agricultural Administration Office, Agricultural Research Institute and Plant Protection Station at Novi Sad; Subotica Federal Plant Quarantine Office; Palić Fruit and Vine Station; Sremski Karlovci Vine and Fruit Institute; Plant Protection Officers at Kikinda and Zrejanin.

Kosmet: Peć Agricultural and Horticultural Institute and Plant Protection Station; Priština Agricultural Administration Office and Plant Protection Station; Plant Protection Stations at Niš and Leskovac; forest areas near Leskovac (aircraft spraying against gipsy moth).

Croatia: Zagreb University Faculty of Agriculture and Forestry; Zagreb Plant Protection Institute; Osijek Plant Protection Stations; Rijeka Phytosanitary Office and affiliated laboratory at Costrenu; forests near Dubica (gipsy moth spraying).

Slovenia: University of Ljubljana; Ljubljana Plant Protection Institute; Jesenice Federal Plant Quarantine Office; Station for Potato Wart Disease investigations near Jesenice; Žalec Hop Research Institute; Maribor Plant Protection Station; Maribor spraying-machine factory; Ptuj Agricultural co-operative's office; Sežana Forestry Office; Koper Plant Protection Station.

Bosnia-Hercegovina: University of Sarajevo; Sarajevo Plant Protection Institute and Secretariat for Plant Protection; Mostar Plant Protection Office; Mostar Tobacco Station; Capaljina Station for Irrigation Research.

Macedonia: Secretariat for Plant Protection at Skopje; Skopje Plant Protection Station; Gostivar Plant Protection Station; Ohrid Orchard and Plant Protection Station; Resen Fruit Station; Bitola Plant Protection Station; Prilep Tobacco Institute.

A lecture was given on 7 May 1956 in Belgrade to the Plant Protection Society of Serbia on the uses of the newer fungicides in agriculture; on 6 June a lecture was given in the University of Sarajevo on the organization and work of the agricultural advisory and research services in the United Kingdom.

Toward the end of the period of survey of plant protection stations and other agencies, a preliminary meeting was held on 8 June with the Head of the Federal Plant Protection Service, when the plans for expanding and modifying the plant protection organization in Yugoslavia were discussed. On the same date, views were exchanged with representatives of the University of Belgrade and of the Chamber of Agriculture on the plans for a weed control laboratory.

At a further meeting on 15 June the Head of the Federal Plant Protection Service with the concurrence of the Chamber of Agriculture, approved the provision of a laboratory, greenhouse and land for a Weed Control center at an estimated capital cost of 25,000,000 dinara. It was agreed that the laboratory should be linked administratively with the Faculty of Agriculture at Zemun (University of Belgrade). Mr. Todorovic asked that FAO should be invited to support the work of this laboratory by the provision of fellowships and by aid in the supply of books and equipment.

IV. FACTORS AFFECTING THE SOLUTION OF THE PROBLEM

(1) Advisory sector

The possibility of educating the grower to increase yields by making adequate use of plant protection methods is limited by the intensity of advisory services and especially by the number of plant protection extension specialists. This service is seriously understaffed. Many of the advisory plant protection stations have been established only since 1954, and are staffed with not more than one or two plant protection officers, who have to serve the whole of a county ('okranj' : 'srej'). The service must be greatly expanded to meet existing and future needs. With such an expansion in view, it would be advisable to plan the main lines of development of advisory services in respect of plant protection.

Proposals for such plans are given below to be implemented as conditions permit. It is appreciated that there is a need to avoid numerous and sudden changes in organization which may be discouraging to the staffs and authorities concerned.

(2) Aims in strengthening advisory work in plant protection

The stimulus and financial resources required to strengthen advisory work in plant protection cannot be left only to the administrations at county level but must be reinforced from Federal and Republic sources. The Federal Plant Protection Service already assists in strengthening the unity and co-ordination of plant protection measures by its direction of special campaigns (e.g. against gipsy moth, locusts, fall webworm, Colorado beetle) and by the stationing of inspectors in the plant protection stations. The immediate need is for special measures to be taken by the Republics.

It is suggested that within the Federal agricultural administration, and within the agricultural administrations of the Republics, and of each of the Autonomous Regions, there should be Councils for Plant Protection, charged with the specific responsibility of expanding the plant protection services. Each Republic Council should hold frequent discussions with the appropriate Chamber of Agriculture, the Union of Co-operatives and the University Faculties concerned with Entomology, Plant Pathology and Weed Control within the Republic.

The immediate aim for each Plant Protection Station should be a minimum staff of two entomologists and two plant pathologists, together with a mechanic trained in the maintenance of application equipment. The entomologists and plant pathologists would give technical direction relative to plant protection measures to the general agricultural advisers as well as direct control activities of the plant protection centers. It is desirable that the Station should have its own land for experimental plots. At least two cars, with adequate garage accommodation, should be available at each Station for the sole use of the plant protection staff.

As the staff and services increase, it is anticipated that the Republic contributions to the County Stations' funds will form an increasing proportion of the total income of these Stations. This would enable the Republic Councils to co-ordinate the work of the Stations and to set up a unified and improved system of salaries, allowances and promotions within the plant protection service as a whole.

As soon as the staffing situation permits, the plant protection extension specialists should be put on a rota to attend short refresher courses at plant protection research laboratories in Belgrade and Zagreb, in order to maintain their contacts with the research staffs, and to ensure that they receive up-to-date information on plant protection developments.

The main function of the plant protection stations should be the dissemination of advice and instruction on pest, disease and weed control, the normal channel being through the co-operatives and extension stations. The work of the stations will include developing a pest and disease warning service, advising on the use of crop protection equipment, exploring the performance of different types of application machines, and training personnel. It is anticipated that the practice of permitting plant protection stations to undertake control measures for payment will become unnecessary as application machines become more widely distributed. Routine applications should be considered the function of the co-operatives.

The use of herbicides for weed control should be given special encouragement, particularly in the poorly-developed agricultural areas where a rapid demonstration of the value of a spray treatment provides useful propaganda for all forms of plant protection.

It is suggested that the Serbo-Croat name for a plant protection station should be standardized as Stanica za Zaštitu Bilja. The use of the title Fitosanitetska Stanica should be restricted to plant quarantine stations.

(3) Research sector

Research in applied entomology and plant pathology has been developed over many years in Yugoslavia, particularly at Belgrade and Zagreb. Facilities for work on insecticides and fungicides are now available at the Phytopharmacy Laboratory at Topčider and in the Plant Protection Institute in Zagreb. The gap in the research service for plant protection is in the field of herbicide studies.

There is a special need for the development of such studies because of the exceptionally wide range of crops (including rice, cotton, tobacco, opium poppy, sunflower and hemp together with the usual Western-European crops) and the equally wide range of weeds, including the phanerogamic parasites Cuscuta and Crobanche and uncommon weeds such as Juniperus and Cynodon. A feature of Yugoslav agriculture is intercropping, and the growing of many different crops in juxtaposition. Consequently, the question of safety levels of the selective herbicides on a large number of different plants is of major importance.

It is therefore suggested that a laboratory should be set up to test existing and future herbicides against (a) weeds (including water weeds and phanerogamic parasites); (b) cultivated plant varieties. Such a laboratory would also deal with enquiries and supply the plant protection advisers with trustworthy information on weed control problems. The laboratory would function as a training ground for workers on herbicides. The knowledge gained at the weed control laboratory, transmitted through the advisory service, would be of major value in ensuring rapid and substantial increases in yields of food and industrial crops. It is envisaged that this laboratory and information center would also be of potential value to the countries neighboring Yugoslavia. The detailed specifications for implementing this recommendation are given in a later section.

A second necessity in the field of plant protection research is the completion and equipment of laboratory and greenhouse facilities for the investigation of sarka disease of plums. This work, under the direction of Professor Josifović, is not described in this report as it is being dealt with by Dr. Lee Hutchins who will give details of the recommendations. Work on sarka is also in progress at Sarajevo where the completion of a greenhouse is an urgent necessity.

It is suggested that the co-ordination of all aspects of plant protection research work dealt with by more than one Republic should be one of the functions of the Federal Council for Plant Protection.

(4) Plant quarantine sector

To help in the exclusion of pests from abroad, and to satisfy requirements for export, there is a pressing need for additional facilities for fumigation of railway trucks. At present, the only fumigation chambers are at Belgrade and Pragersko. Others are needed at Rijeka, Ljubljana, Subotica, Gevgelia and Niš.

(5) Provision and testing of crop protection equipment

The proposed rapid expansion in the acreage to be treated for the control of pests, diseases and weeds calls for a corresponding increase in the output of spraying and dusting equipment. Good progress is being made at the Maribor factory, but this needs to be supplemented. An additional factory sited for example, at Niš, would be valuable in providing machines and spare parts for the southern half of the country where the need is specially acute.

An organization for testing the performance of Yugoslav and imported crop protection equipment is desirable. It is suggested that such an Organization should be set up as part of the Agricultural Engineering Institute at Zemun.

SPECIFICATIONS FOR THE RECOMMENDED WEED CONTROL LABORATORY
AND INFORMATION CENTER

The proposals for the layout, staffing and equipment of the weed control laboratory and information center are as follows:

Buildings: Single-storey building with two laboratories, each approx. 6 x 6 m., and library 7 x 7 m. Stores and garage for spraying equipment. Greenhouse, approx. 7 x 7 m., divided into ten sections, one to be used as a spraying chamber.

Land: Not less than 5 ha. of experimental plots to provide material of the principal varieties of agricultural and horticultural crops widely grown in Yugoslavia. Ponds and ditches for work on water weeds.

Staff: Head of Laboratory.
Two scientific officers (Degree in Agricultural Engineering).
Two assistants (Certificate of Secondary Agricultural School).
One driver-mechanic.
Two full-time workmen.

Special Equipment Required

Laboratory

Research microscope, binocular microscope, photomicrographic equipment, polythermostat, photo-electric pH meter.

Field

Two variable-dosage sprayers, two Oxford precision sprayers, one field plot sprayer, Land Rover car (for visits to outside trials).

Greenhouse

Laboratory sprayer, spray cabinet and turntable.

Library and Information Center

The following books and pamphlets are needed to form the nucleus of a library on weed control:

Journals: Annals of Applied Biology (from 1945), Cambridge University Press, London.
Weeds Abstracts, Unit of Experimental Agronomy, University of Oxford.
Weeds (Journal of the Weed Society of America), Agronomy Department, University of Illinois.

Books: Long, H.C. and Brenchley, W.E. (1949). Suppression of Weeds by Fertilisers and Chemicals: Crosby, Lockwood: London Bates, G.H. (1948). Weed Control: Farmer and Stockbreeder: London. U.S. Department of Agriculture (1952). Manual for Testing Agricultural and Vegetable Seeds: U.S.D.A. Handbook no. 30. Audus, L.J. (1953). Plant Growth Substances: Leonard Hill, London. Robbins, W.W., Crafts, A.S. and Raynor R.N. (1952) Weed Control: McGraw-Hill Book Co., New York. Helgeson, E.A.: Methods of Weed Control (FAO Agr. Studies in press) Ahlgrin, G.H., Klingman, G.C. and Wolf, D.E. (1951). Principles of Weed Control: John Wiley and Sons: New York. Watson, S.J. (1951). Grassland: London. Clapham, A.R. (1953). Flora of the British Isles: Cambridge University Press, London.

Bulletins and Pamphlets: The Suppression of Weeds: N. Ireland Ministry of Agriculture Leaflet no. 124 (1954). Berrie and Nisbet (1954). Hormone Weedkiller: W. of Scotland Agric. Coll. Leaflet no. 32. The control of weeds in peas with dinoseb: Ministry of Agr. Advisory Leaflet 376 (1953). The control of rushes: Ministry of Agr. Advisory Leaflet 408 (1955) The economics of crops spraying: Cambridge Univ. School of Agr. Farmers' Bulletin 16 (1954). British poisonous Plants. Ministry of Agr. Bulletin 161 (1954). Pearce, H.L. Growth substances and their practical importance in Horticulture: East Malling Research Station Technical Communication No. 20. Wain, R.L. Plant Growth Substances: Royal Institute of Chemistry Mimeograph No. 2. Brown, D. Methods of surveying and measuring grassland vegetation: Commonwealth Bureau Pastures and Field Crops Bulletin 42 (1954). Turrill, W.B. Mapping the ranges and distribution of taxonomic groups of plants. Kew Bulletin (1954). Brune, V.B., Rasmussen, L.W. and Wolf, H.H. Quackgrass (Agropyron repens) control in Washington: Washington State Coll. Ext. Misc. Publications 20. (1954). Evans, L.S., Mitchell, J.W. and Heinen, R.W. (1948): Using 2:4-D safely. U.S. Dept. Agric. Farmers' Bull. 2005 Crafts, A.S. (1949). Control of aquatic and ditchbank weeds. Calif. Agric. Ext. Service Circular 158. Akesson, N.A. and Harvay, W.A. Chemical Weed control equipment: Calif. Agric. Exp. Sta. Circular 389. Ellison, E.J. (1948). The use of oil sprays for the control of weeds in coniferous nurseries: New York State Conservation Dept. Mimeographed publication. Hiscock, H.W. and Olson, A.R. The toxicity to plants of weed-killing preparations and their solvents. Conn. Agric. Exp. Sta. Circular 189 (1954).

